

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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U.S. Patent Application

for

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STORAGE AREA NETWORK METHODS AND APPARATUS WITH VIRTUAL SAN  
RECOGNITION

**Background of the Invention**

The invention pertains to digital data processing and, more particularly, to storage area networks and methods of operation thereof. The invention has application, for example, in managing  
5 access by a plurality of digital data processors (e.g., web or file servers, graphical workstations and so forth) to a plurality of disk drives, disk arrays and other storage devices.

In early computer systems, long-term data storage was typically provided by dedicated storage devices, such as tape and disk drives, connected to a data central computer. Requests to read and  
10 write data generated by applications programs were processed by special-purpose input/output routines resident in the computer operating system. With the advent of "time sharing" and other early multiprocessing techniques, multiple users could simultaneously store and access data-- albeit only through the central storage devices.

15 With the rise of the personal computer (and workstation) in the 1980's, demand by business users led to development of interconnection mechanisms that permitted otherwise independent computers to access data on one another's storage devices. Though computer networks had been known prior to this, they typically permitted only communications, not storage sharing.

20 The prevalent business network that has emerged is the local area network, typically comprising "client" computers (e.g., individual PCs or workstations) connected by a network to a "server" computer. Unlike the early computing systems in which all processing and storage occurred on a central computer, client computers usually have adequate processor and storage capacity to

execute many user applications. However, they often rely on the server computer -- and its associated battery of disk drives and storage devices -- for other than short-term file storage and for access to shared application and data files.

5 An information explosion, partially wrought by the rise of the corporate computing and, partially, by the Internet, is spurring further change. Less common are individual servers that reside as independent hubs of storage activity. Often many storage devices are placed on a network or switching fabric that can be accessed by several servers (such as file servers and web servers) which, in turn, service respective groups of clients. Sometimes even individual PCs or  
10 workstations are enabled for direct access of the storage devices (though, in most corporate environments such is province of server-class computers) on these so-called "storage area networks."

A drawback in prior art storage area networks arises in managing the proliferation of hosts and  
15 storage devices. Current solutions focus on setting switches or switch-like interfaces on the network or interconnect fabric between the hosts and storage device, electrically "blocking" certain hosts certain storage devices and so forth. A problem with these solutions is that they permit only zoning or switch-like control. Another problem is that, by their very nature, these solutions tend to be provider specific.

20 An object of this invention is to provide improved storage area networks and methods of operation thereof.